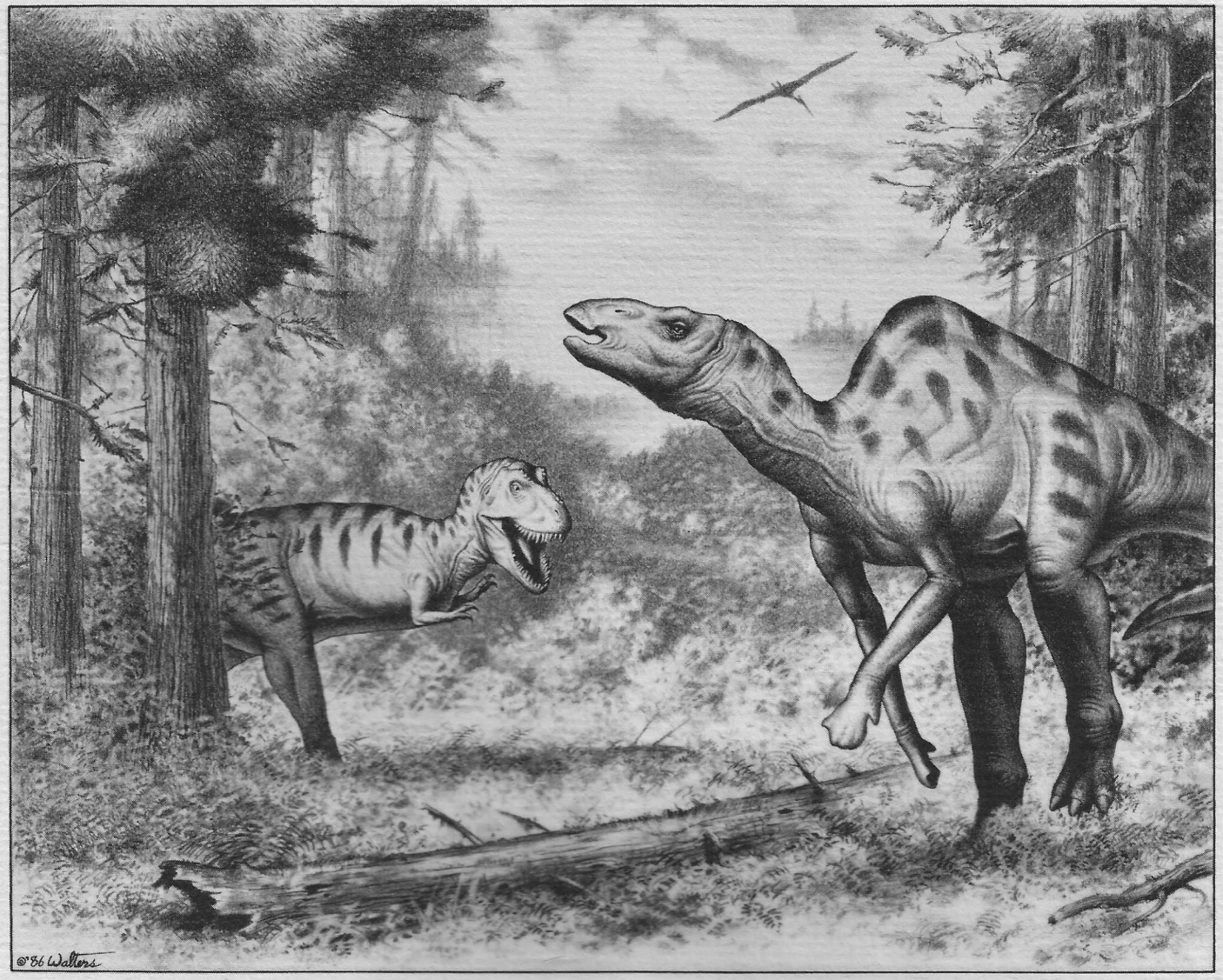
THE MOSASAUR



THE JOURNAL OF THE DELAWARE VALLEY PALEONTOLOGICAL SOCIETY

VOLUME III

NOVEMBER, 1986

HAWKINS' HADROSAURS: THE STEREOGRAPHIC RECORD

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Abstract

In November of 1868, the world's first restored and mounted dinosaur skeleton was unveiled at the Academy of Natural Sciences in Philadelphia. Until completion of the first of the Bernissart iguanodons in 1883, the Academy skeleton of *Hadrosaurus foulkii* Leidy and three plaster duplicates subsequently cast by sculptor Benjamin Waterhouse Hakwins were the only such specimens on public display anywhere in the world. None of Hawkins' skeletal restorations still exist and, until now, photographic documentation of these important works has been confined to a few views taken after 1880. Stereographs, the most widespread form of non-portrait photography in the Nineteenth Century, represent an as yet little explored source of historical information, and views are presented which show three of the four *Hadrosaurus* skeletons in the 1870s, as well as the type specimen of *H. foulkii* before its restoration by Hawkins.

The earliest dinosaur remains found in North America, except for a few scattered teeth from the Judith River badlands of Montana, are those of *Hadrosaurus foulkii* Leidy, unearthed in Haddonfield, New Jersey, in 1858. The discovery, by William Parker Foulke, was made in an abandoned and overgrown marl pit on the farm of John Hopkins. The bones were in marine sediments of the Woodbury Formation, and their discovery was prompted by reports that a quantity of large bones had been removed from the pit some twenty years before. Furthermore, with perhaps thirty percent of the skeleton extant, *Hadrosaurus foulkii* was the most complete dinosaur skeleton yet found and presented the first clear evidence for possible bipedalism in dinosaurs. *Iguanodon* and *Megalosaurus* had a few years earlier been depicted at England's Crystal Palace as quadrupeds.

The architect of the Crystal Palace dinosaurs was Benjamin Waterhouse Hawkins (1807-1889), a talented London-born painter and sculptor who, as early as 1839, had collaborated with Charles Darwin on the illustrations for one of the *Beagle* monographs. Hawkins established his reputation as author-illustrator of several anatomical studies of various animals, which he published as aids to artists. From 1853 through 1855, working under the careful supervision of the noted paleontologist and anatomist Sir Richard Owen (who had coined the term dinosaur in 1841), Hawkins had built his life-sized replicas of

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dinosaurs and other "antediluvian animals" on the grounds of the Crystal Palace at Sydenham, just outside London. Placed on islands in an artificial lake, Hawkins' models represented an exceptionally bold undertaking, including, in addition to the dinosaurs, several pterosaurs, a number of marine forms, and a variety of Cenozoic mammals. Though widely praised at the time, Hawkins' creations provoked only derision when viewed by Yale's Othniel C. Marsh in 1895. This was less a comment on Hawkins' artistic skills than on the remarkable strides vertebrate paleontology had taken in the second half of the Nineteenth Century.

In March of 1868, Hawkins arrived in New York to begin a series of popular lectures on natural history and the arts. At the beginning of May, he was approached by the Board of Commissioners of Central Park with the proposal that he "undertake the resuscitation of a group of animals of the former periods of the American continent" (Board of Commissioners, 1869, p. 132). Hawkins quickly accepted this extraordinary offer and spent the next several months examining the collections of museums from Boston to Washington, even venturing (unproductively) as far afield as Chicago. But it was at the Academy of Natural Sciences of Philadelphia that Hawkins uncovered "a rich storehouse of fossil treasures of special value for the purpose of illustrating the gigantic forms of life that originally inhabited this continent" (Board of Commissioners, 1869, p. 135).

Hawkins took up residence in Philadelphia and spent most of his time there until the beginning of December. His initial reception at the Academy was somewhat cautious but, with the backing of the New York Lyceum's J. S. Newberry and his own demonstrated abilities as a volunteer preparator, Hawkins quickly won the confidence of Joseph Leidy and others. Upon the completion of his usual methodical preliminary drawings, Hawkins faced a new and unprecedented technical challenge.

> **"Early in September I commenced the work of molding every individual fragment of the Hadrosaurus; the permission to do this was only accorded on condition that the moulds should be taken without the slightest injury to the specimens, or any mark of any kind being left on their surface. This involved the necessity for an elaborate preparation of each individual fossil to protect its surface from the action of the plaster in the operation of moulding. To do this effectually, I had to envelope every separate fragment in a thin paper tissue . . . ." (Board of Commissioners, 1869, pp. 136–137).**

Hawkins then began by careful modeling to restore the missing parts of the skeleton and in so doing engaged in a bit of inspired—if not very successful—legerdemain. The one conspicuous feature missing from *Hadrosaurus* was the skull and, since the teeth of both this dinosaur and *Iguanodon* (which Leidy had pronounced a close relative of *Hadrosaurus*) resembled those of the living iguana, Hawkins simply scaled-up the skull of one of these lizards.

Having been elected to full membership in the Academy in August, Hawkins, at his own expense, presented to the institution on November 21 a completely restored and mounted skeleton of *Hadrosaurus*, an act which the Academy acknowledged in an official resolution praising Hawkins' "profound paleontological knowledge, artistic skill and patient industry" (Hawkins Album, Academy of Natural Sciences). One commentator was even sufficiently inspired to suggest that "nothing would so add to the value of our new Academy of Natural Sciences as a geological saloon similar to that about to be erected in Central Park" (*Lippincott's Magazine*, 1868, p. 561).

Alas, the "Palaeozoic Museum" never did materialize, although Hawkins had completed several of his restorations before a change in the city charter in May of 1870

placed Central Park under the jurisdiction of the notorious Tweed Ring, which promptly quashed the project. The official claim that the cost of the proposed museum was excessive, though outwardly ludicrous given the Tweed Ring's fiscal misdeeds, may be legitimate nonetheless; Boss Tweed and his cronies were unlikely to authorize so large an expenditure without commensurate benefits in either graft or patronage. The subsequent demolition of the restorations and models in Hawkins' Central Park studio on May 3, 1871, by hirelings of Tweed, a shocking act of vandalism, may have been in retaliation for Hawkins' appeal for public support before the Lyceum of Natural History on March 6th, a meeting that led to some heated denunciations of the city administration. The Tweed Ring had not previously demonstrated any real hostility toward Hawkins, employing him on architectural studies for the Central Park menagerie while his paleontological work was held in abeyance. In any event, there appears to be no evidence for the contention, voiced in Schuchert & LeVene (1940) and subsequently picked up in some popular literature (Desmond, 1975; Glut, 1980; Lewis, 1981), that the destruction was anti-Darwinian in motivation. (Hawkins himself had followed his old mentor Owen in adopting a somewhat critical view of Darwin's work.)

If Hawkins was now unemployed, he had managed to save the molds for the skeleton of *Hadrosaurus* and, in March of 1874, he cast a duplicate skeleton for the College of New Jersey (now Princeton University), which was set up in Nassau Hall. Sometime during the next fifteen months, he completed a second plaster cast, this time for the Smithsonian Institution in Washington, D.C. Hawkins' third *Hadrosaurus* "clone" was commissioned by a British exhibitor for the 1876 Centennial Exhibition in Philadelphia; a last-minute order, this skeleton was not completed until May of 1876 and, upon the close of the fair, was shipped to the Royal Scottish Museum in Edinburgh where it became, in 1879, the first dinosaur skeleton exhibited in Europe. (A fifth hadrosaur skeleton—actually the second in order of appearance—had been completed at the Central Park studio but was destroyed before it could be exhibited, a victim of Tweed's 1871 vandalism.)

The Edinburgh skeleton was dismantled during the First World War in order that its ironwork could be contributed to the scrap drive. When the plaster cast itself was finally discarded in 1928, only the original Academy *Hadrosaurus* remained on public display. The Princeton skeleton, a victim of both overcrowding and the late Nineteenth Century discoveries of Cope, Marsh, and others, had already succumbed to a series of contrived "accidents." The Smithsonian cast fared somewhat better. Removed from the lower main hall of the "Castle" to the less-prestigeous Arts and Industries Building in 1881, it was donated in 1893 or 1894 to the new Field Museum of Natural History in Chicago; but it subsequently vanished when that museum moved to new quarters a decade later.

When the Academy of Natural Sciences finally took down its *Hadrosaurus* around the time of the Second World War, the restoration was already an anachronism, as much a denizen of the past as the dinosaur it portrayed. Hawkins' hadrosaurs had, however, helped for an entire generation to mold the public image of dinosaurs. Such images have experienced their own pattern of evolution, from the bizarre reptilian quadrupeds of the Crystal Palace through Hawkins' hadrosaurs to the "conventional" restorations of Charles R. Knight and others, and finally to the more active "hot-blooded" restorations of our day.

Hawkins' hadrosaurs represented an important step in this transition. When the Academy of Natural Sciences opened its new dinosaur hall in January of 1986, a cast of the original specimen of *Hadrosaurus foulkii*, stripped of Hawkins' accretions, was given the prominent place it richly deserves. The original plaster skull Hawkins imaginatively

modelled for his restoration is also preserved in the Academy exhibit, a fitting tribute to a paleontological pioneer. During a career that began when he was nearly fifty and spanned a quarter century, Hawkins had either introduced or at least proposed the life-size model, the "dinosaur park" concept, the free-standing skeletal mount (at least as applied to dinosaurs), and the half-mount. He also produced a comprehensive series of paleontological paintings for the College of New Jersey, some of which remained unfinished when the artist returned to England in 1879.

Photographic documentation of Hawkins' hadrosaurs is more abundant than has hitherto been supposed, not having been reflected in the literature. Prior to 1985, the only published images appear to have been two views of the Smithsonian cast in the Field Museum in the 1890s (Glut, 1972, 1980) and a single, relatively late view of the Academy *Hadrosaurus* (Lull & Wright, 1942), along with a heavily doctored image of Hawkins standing beneath the 1868 skeleton in the old Academy building at Broad and George Streets, published in the *Twelfth Annual Report* of the Board of Commissioners of Central Park (1869). Additional unpublished views exist of the Academy skeleton in the Twentieth Century and of the Smithsonian cast in the Arts and Industries Building in the 1880s. The Academy also has recently acquired an album of material relating to Benjamin Waterhouse Hawkins that includes a photograph taken in the Central Park studio showing the ill-fated New York hadrosaur. This image is especially informative, in that it also documents Hawkins' mounting of a partial skeleton of *Dryptosaurus*, the artist innovatively using the armature to outline the missing portions of the dinosaur.

Pictorial evidence of Hawkins' hadrosaurs from the decade of the 1870s appears to be limited exclusively to the medium of the stereograph, the predominant form of non-portrait photography in the late Nineteenth Century. Stereographs—paired photogrpahs which when properly viewed provide the illusion of a single three-dimensional image—arose from the fusion of two unrelated developments in the late 1830s: Sir Charles Wheatstone's experiments with stereoscopic drawings and the discovery of practical methods of photography by J. L. M. Daguerre, William Henry Fox Talbot, and others. With the advent of the collodion or "wet-plate" process in the early 1850s, stereographs became immensely popular and remained so at least through the end of the First World War.

The amount of photographic documentation provided by stereographs is staggering. William C. Darrah, the premier authority on stereographs, estimated that approximately 12,000 stereographers operated in the United States alone and produced from five to six million different images (Darrah, 1977). Although much of this material has been lost, a considerable proportion remains in the hands of private collectors and institutions. Since stereographers exploited virtually every type of subject matter, it is not surprising that, though uncommon, views pertaining to paleontology may be encountered with some regularity.

At least seven stereographs of Hawkins' dinosaurs are known, along with several amateur views of the original type specimen of *H. foulkii* before its reconstruction by Hawkins. These amateur views, acquired by the Academy from the Leidy estate, may have been taken as early as December of 1858.

The Academy *Hadrosaurus* appears in two of a series of three stereographs produced by the Academy itself at the time of the Academy's move to its present location in 1876. Intended for sale at the museum, these views are on card stock similar to that used by James Cremer, the largest publisher of commercial stereographs in Philadelphia at the time, and it has been suggested (Darrah, personal communication) that the institution may have commissioned Cremer to produce the set. The third view

in the set is an exterior view of the Academy building. Montgomery P. Simons, of 1320 Chestnut St., also stereographed inside the Academy sometime between 1866 and 1877, but whether he produced any views of *Hadrosaurus* is at present unknown.

The Princeton skeleton was stereographed in Nassau Hall by Royal H. Rose, a little-known local photographer, sometime in the late 1870s or early 1880s. The view was part of a series that ran to at least 38 titles, although the scope of subject matter included in the group has not yet been determined.

The Smithsonian hadrosaur appears in stereographs by T. W. Smillie, E. & H. T. Anthony, and J. F. Jarvis, all taken in the mid- to late-1870s, before the skeleton was removed from the "Castle." Thomas Smillie was born in Edinburgh, Scotland, in 1843, and began working for the Smithsonian about 1870, serving as official photographer of the Museum from June of the following year until his death in March of 1917. Edward Anthony, of 591 Broadway, New York, partnered with his brother Henry to produce in the 1860s and early 1870s the largest line of stereographs in the United States (more than 11,300 titles, including Mathew Brady's famous Civil War views); he also operated the largest photographic supply house in the world. Since the Anthonys reportedly stopped issuing cards with their own imprint in 1874, their two views of *Hadrosaurus* must have been taken within a few months of the skeleton's completion. Jarvis too had begun in the photographic supply business, in Omaha in the late 1860s, before moving to Washington to become for two decades that city's largest manufacturer of stereographs.

Perhaps because of its late completion date, the Centennial/Edinburgh hadrosaur apparently escaped being captured in any of the more than 2,000 photographs (stereo and otherwise) issued by the Centennial Photographic Company, which held a monopoly on the art within the Exhibition grounds. This is the only one of Hawkins' five hadrosaurs of which no photographic image is known to exist.

Stereographs then represent a major part of the documentation of an important episode in the history of paleontology in the Nineteenth Century, and it is to be hoped that the record will be further augmented by the discovery of additional images.

Acknowledgements

Donald Baird of the Geological Museum, Princeton University, graciously consented to become a literal fount of information on the subject of Hawkins' hadrosaurs, sharing with the author many details of his own unpublished research. Carol Spawn kindly provided early access to the Hawkins Album held in the Library of the Academy of Natural Sciences of Philadelphia. William C. Darrah and other members of the National Stereoscopic Association also provided useful comments and encouragement.

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Figure 1. Joseph Leidy with the tibia of *Hadrosaurus foulkii.* An amateur stereograph probably taken between 1858 and 1861. *(Academy of Natural Sciences of Philadelphia)*

Figure 2. The type specimen of America's first dinosaur, *Hadrosaurus foulkii*, on display at the Academy of Natural Sciences. An amateur stereograph probably taken between 1858 and 1861. *(Academy of Natural Sciences of Philadelphia)*

Figure 3. "Antediluvian Animals, Crystal Palace," by London Stereoscopic Co., early 1860s. Hawkins restored his Crystal Palace iguanodons as quadrupeds, with the thumb spike incorrectly interpreted as a nose horn. Although the Crystal Palace burned in 1936, Hawkins' models still exist. *(Author's collection)*

Figure 4. Interior of the new Academy of Natural Sciences building in 1876, with Hawkins' restored *Hadrosaurus* dominating the main exhibit hall. *(Author's collection)*

Figure 5. "Skeleton of the Great Fossil Lizard of New Jersey," possibly by James Cremer, 1876. The original specimen of *Hadrosaurus foulkii* as reconstructed by Benjamin Waterhouse Hawkins in 1868. *(Author's collection)*

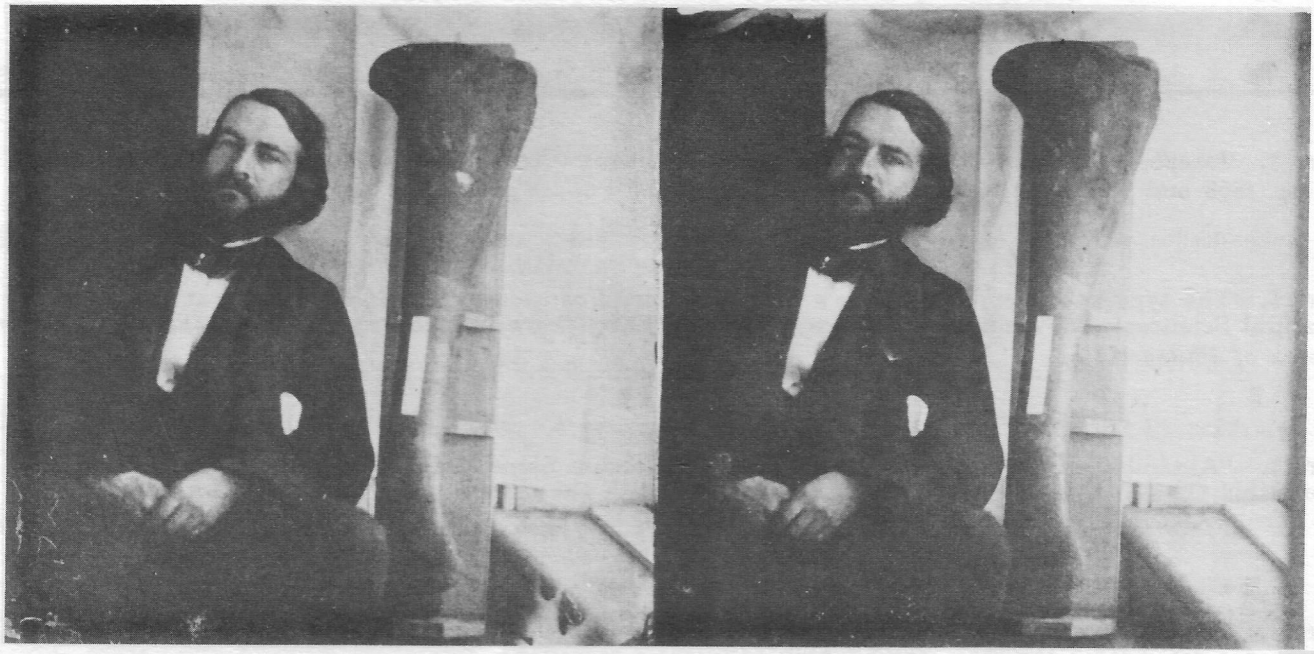
Figure 6. Royal H. Rose's view of the Princeton cast in Nassau Hall, late 1870s or early 1880s. Hidden behind *Hadrosaurus* is Henry Ward's equally impressive cast of the Pleistocene ground sloth, *Megatherium.* Professor Franklin C. Hill stands at left and Hawkins' series of geological paintings hang from the balcony. *(Author's collection)*

Figure 7. "Kangaroo Lizzard" [*sic*], by Thomas W. Smillie, mid–to late–1870s. The Smithsonian's *Hadrosaurus* stands in the lower main hall of the "Castle" before its transfer to the Arts and Industries Building in 1881. The "Kangaroo Lizard" theme was a frequently recurring one in the late Nineteenth Century and stems from Leidy's description of the animal in 1858. *(Author's collection)*

Figure 8. This view of the Smithsonian hadrosaur by E. & H. T. Anthony, circa 1874, shows Hawkins' great Irish elk (*Megaceros*) in the background, suggesting that the destruction of the Central Park studio in 1871 might not have been as complete as long supposed. *(Author's collection)*

Figure 9. Anthony's two views of the Smithsonian *Hadrosaurus* were among the last stereographs published by the firm. Hawkins' casts were impressive by any standards, measuring 26 feet in length and standing more than 13 feet tall. *(Author's collection)*

Figure 10. J. F. Jarvis also stereographed the Smithsonian cast in the late 1870s, and there are probably other views as well. This is the specimen that wound up in the Field Museum in Chicago. *(Author's collection)*



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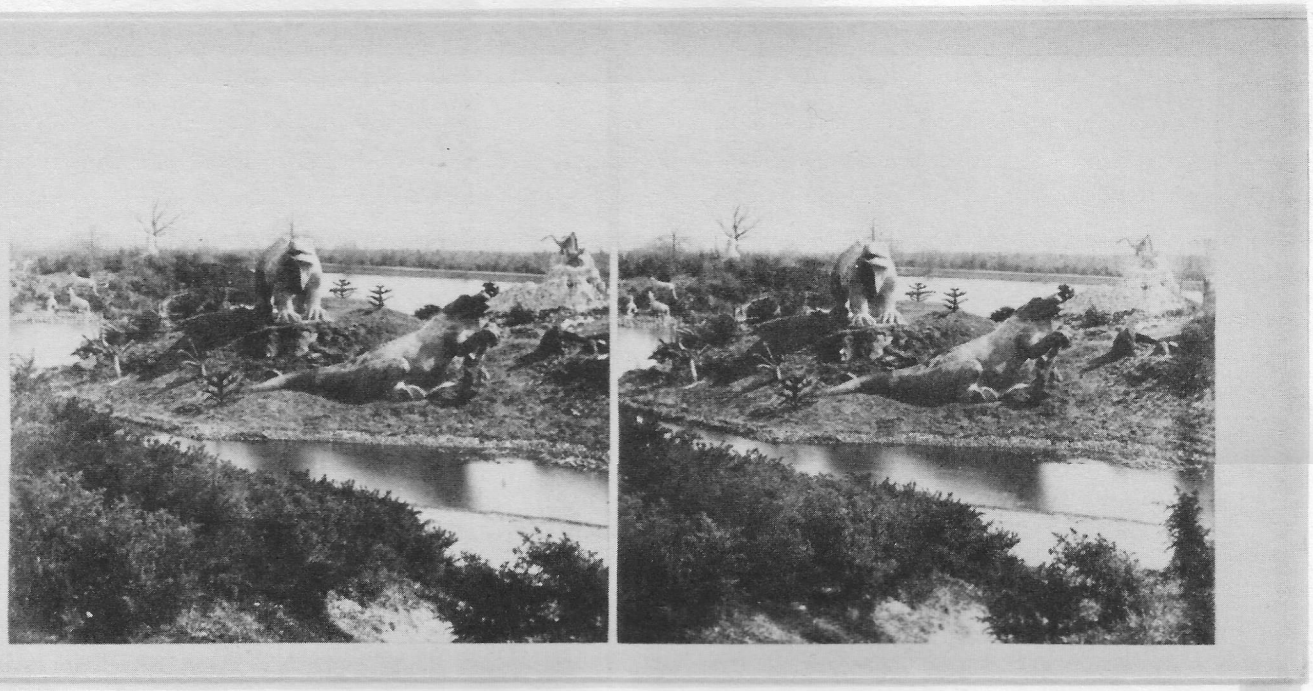

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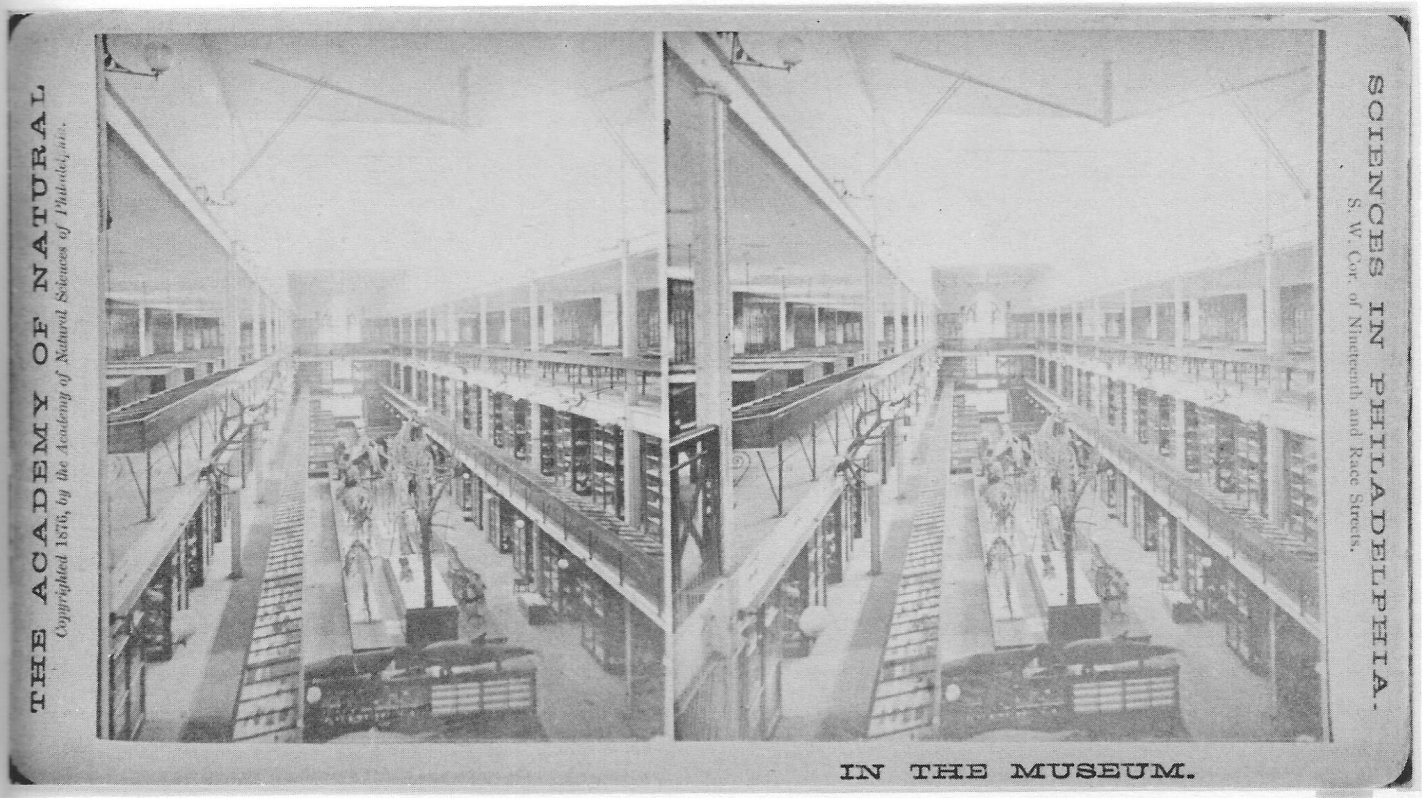
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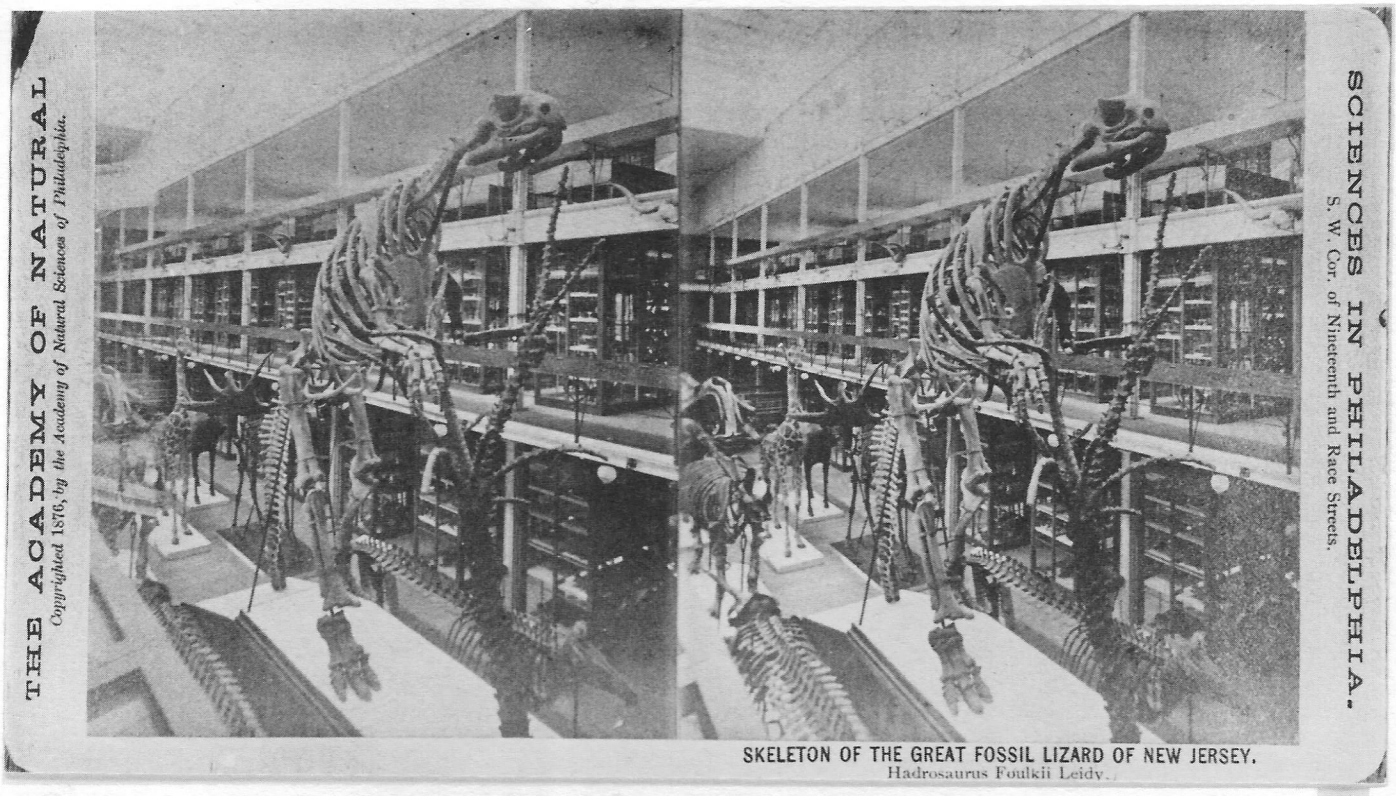
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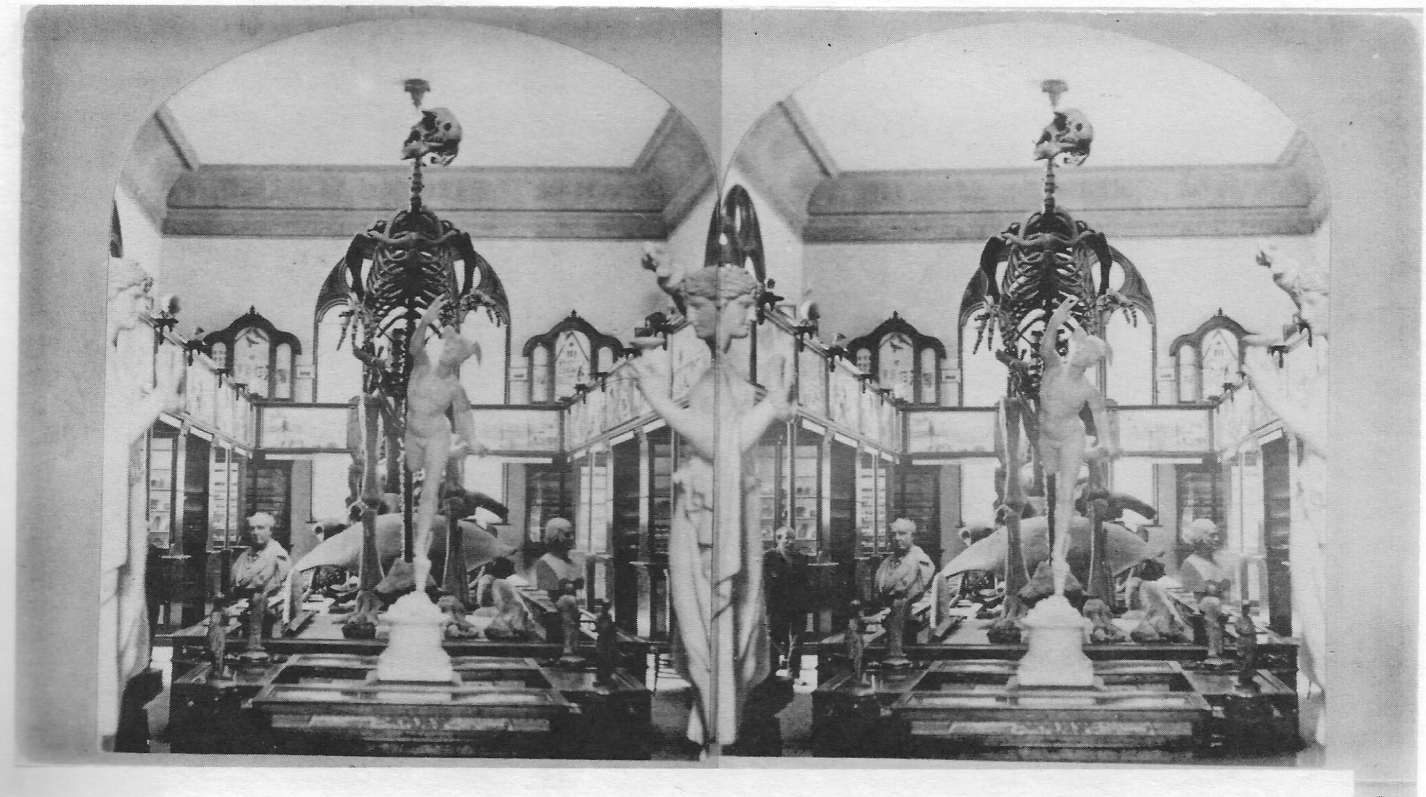

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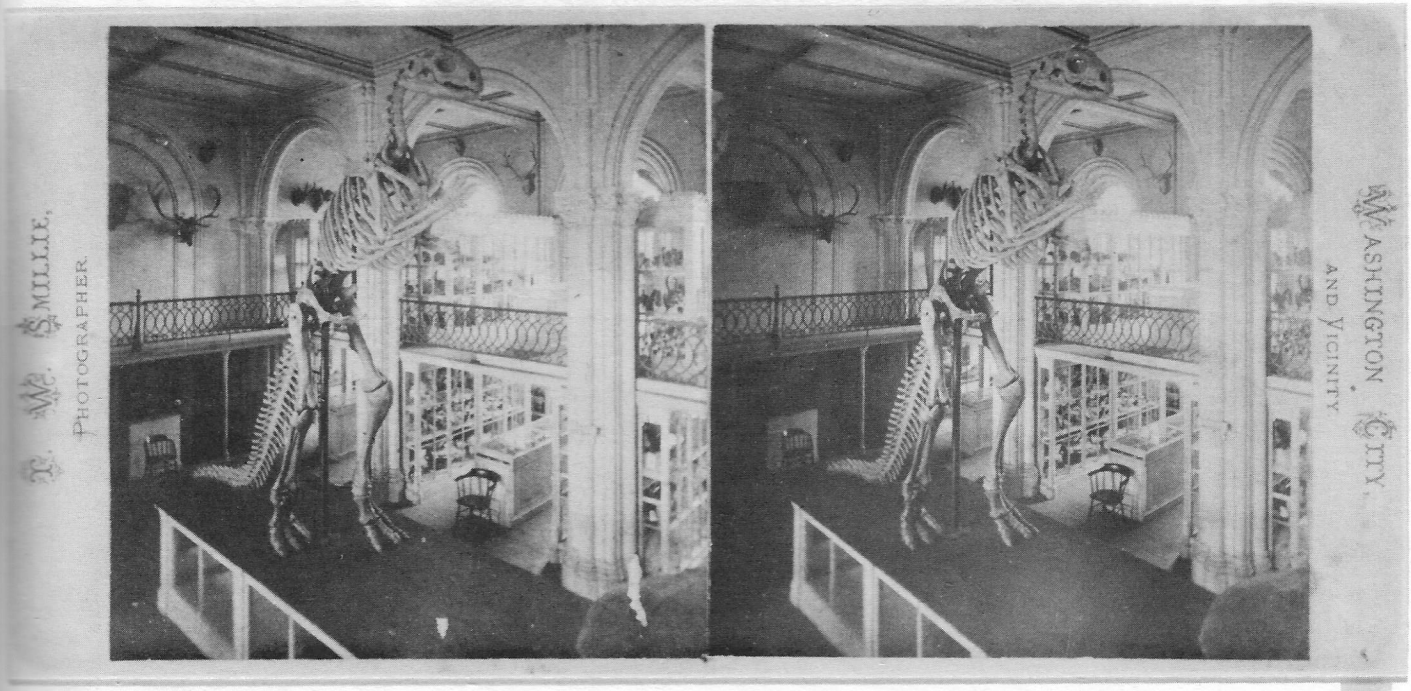
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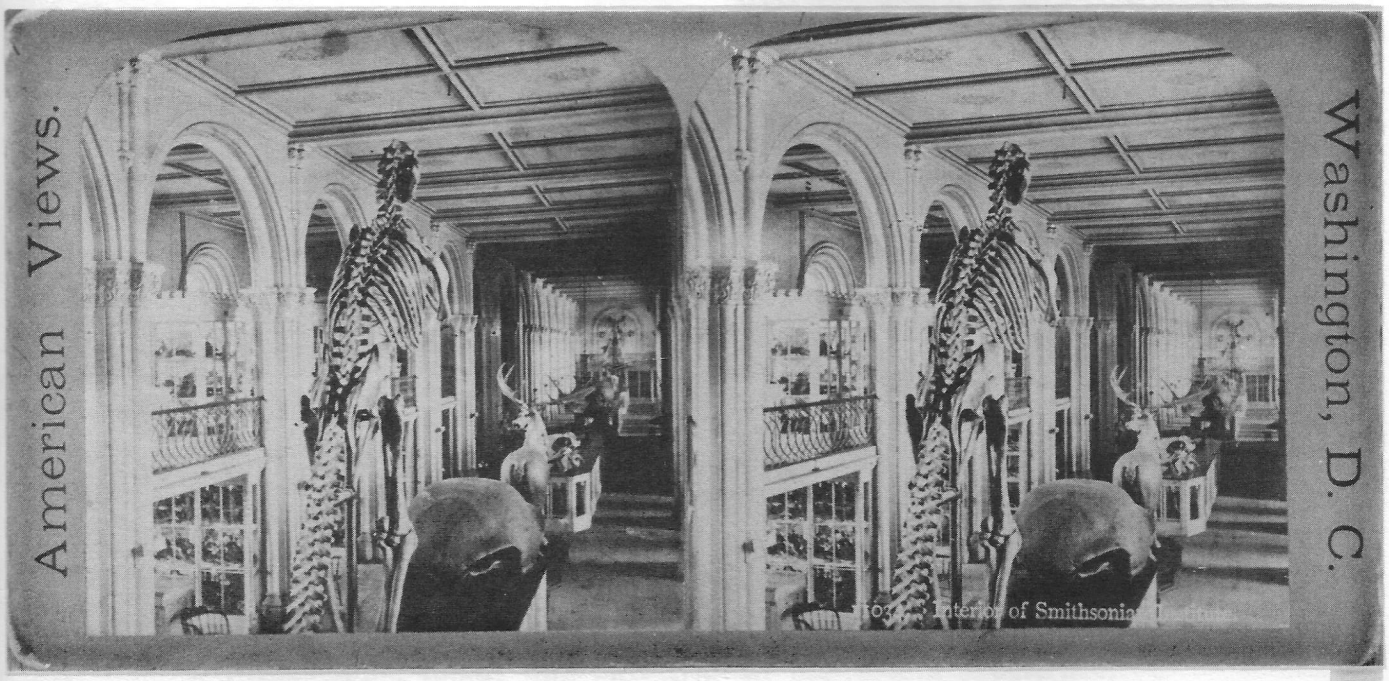
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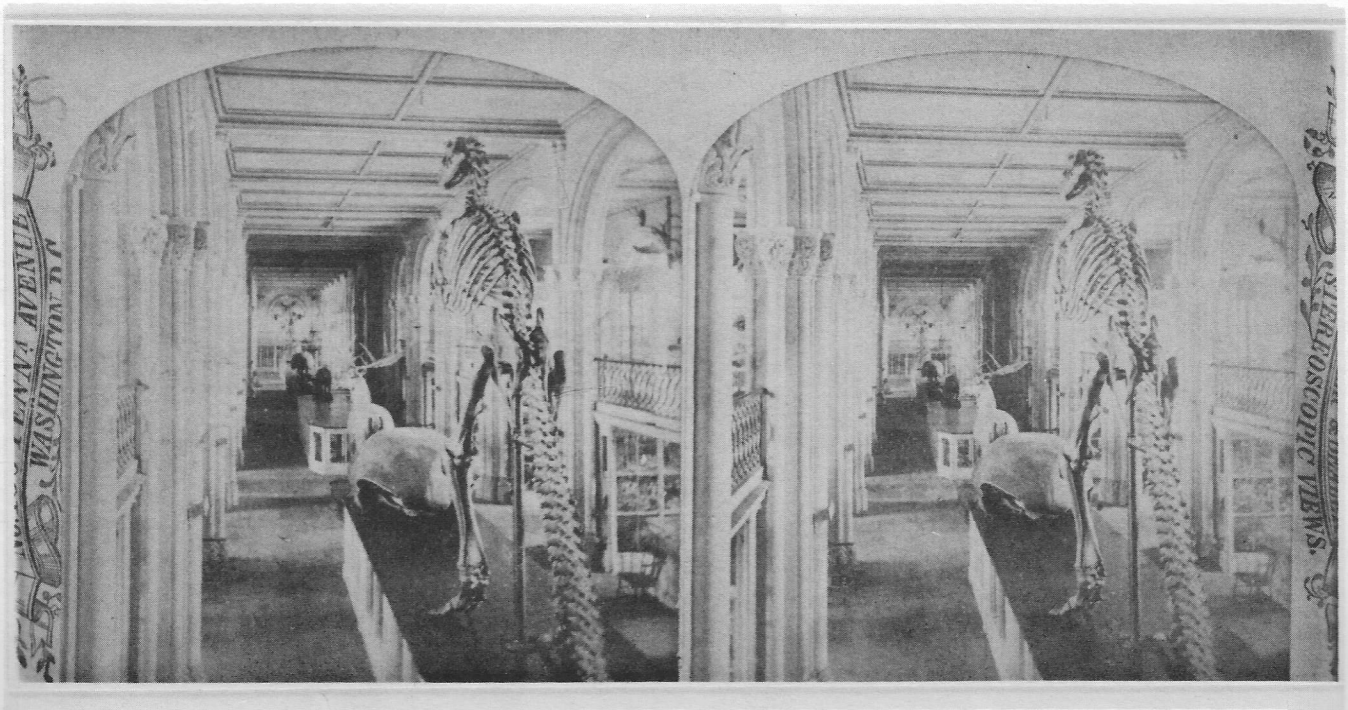
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